Honeywell

White Paper

The Turbine Advantage

LV50 Integrated Turbine Power Pack System For the Future Combat System

Abstract

Honeywell's Integrated LV50 Turbine Power Pack System offers the best low-risk solution for the Future Combat System with better value, performance and protection advantages over diesel power platforms.

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Honeywell's LV50 Turbine Power Pack System:
The Clear Value Solution for the Future Combat System

Turbine or Diesel***?*** More than 25 years after it began, the debate continues over the relative benefits of diesel vs. turbine power plants for military combat vehicles. But when all the critical factors are considered, it's clear that the Honeywell LV50 Integrated Turbine Power Pack System is the best solution for the Future Combat System (FCS).

Just as turbine power has revolutionized the operational performance of military and commercial helicopters and fixed-wing aircraft, turbine engines have changed the game for ground combat vehicles. There's simply no comparison between the power, performance and reliability provided by a turbine engine and that of a diesel engine.

A turbine power pack already powers the most elite and capable U.S. combat vehicles in the U.S. arsenal – the battle proven M1 Abrams series of tanks. In both Iraqi conflicts, turbine-powered M1s have provided America's fighting forces with the lethal edge that enabled them to quickly gain and maintain ground superiority. The turbine engine for the M1 Abrams series has performed extremely well in more than 26 million miles of total experience.

Honeywell's LV50 Integrated Turbine Power Pack System for the FCS embodies the best of turbine-power technology for ground vehicles. It provides capabilities that offer distinct advantages over diesel-power options, as well as significant advancements from earlier-generation turbine engines.

Turbines leave the other guys miles behind. When all the critical success factors are considered, there's no question that Honeywell's LV50 Integrated Turbine Power Pack System is the low-risk choice for the Army, an excellent value for the American taxpayer, and a powerful solution for soldiers in the field – enabling them to fulfill their missions.

The Turbine Power Pack Delivers a Performance Edge at an Affordable Price

The turbine solution is a sure thing for the U.S. Army. The turbine engine solution offers the lowest risk and the lowest total cost of ownership for the U.S. Army. Turbine-powered vehicles can go longer, require less maintenance and have a much smaller logistics footprint than diesel-powered vehicles. They also have a better survival rate in combat, which means that fewer replacement vehicles and spares are required, creating a smaller logistics footprint.

The LV50 system is based on a proven Honeywell helicopter turbine core. The critical design requirements and high power-to-weight ratios demanded by high-performance helicopter operation and inherent turbine technologies result in a higher initial investment cost than with a diesel engine in the same power class. However, the technology advantages of turbines provide lower operating and support costs over the longer life (40-50 years) of the turbine system.

Honeywell's extensive experience has demonstrated that high turbine durability results in lower Life Cycle Costs. Scheduled maintenance events for turbines have longer intervals and require fewer parts than diesels. Higher turbine reliability translates into fewer scheduled maintenance events, which in turn translates into fewer required spare engines. Since the turbine has fewer parts to wear out compared to a diesel, the supply chain requirements are also smaller. Lower maintenance frequencies, lower part quantities and use of commercial dual-use parts help to keep inventory costs low and the logistics pipeline small and responsive.

Only the LV50 Integrated Turbine Power Pack System is capable of 30 percent power expansion within the same envelope to meet the Army's future needs – delivering a significant cost benefit over the life of the vehicle without adding additional size or weight. Historically, a weapon system's total weight grows as it is developed. Abrams has grown 10 tons, Bradley five tons and Stryker four tons. The LV50's 30 percent growth capability within the same frame provides vehicle flexibility, supports future electrical weapons, reduces program risk and lowers cost.

Turbines provide the quiet confidence needed for the FCS. Combat vehicles equipped with turbine engines are more survivable. Turbines have been demonstrated to run 15 decibels quieter than diesels, making them much harder for an enemy to hear. Turbines start and run clean, unlike diesels which produce visible smoke, making them easier for an enemy to see. Turbines are hard to see, hard to hear and hard to hit.

The Turbine Power Solution Weighs Less and Takes Up Less Space

Turbine engines are lean and mean. Honeywell's LV50 Integrated Turbine Power Pack System is 1,000 to 1,200 pounds lighter than a diesel system. And, only the LV50 System can be installed in the sponson, which saves a refrigerator-sized 24 cubic feet of space – more than 5 percent of the available compartment space. This space and weight advantage makes it possible to reduce the overall size of the vehicle, resulting in additional weight savings of 800-1,200 pounds.

Lower fighting weight enhances overall performance of the vehicle in all its operational modes and significantly reduces wear and tear – expanding the vehicle's useful life. In addition, reduced weight makes it easier and more efficient to transport the vehicle by C-130 aircraft. Space and weight savings can be dedicated to more mission-essential payloads, such as additional armor, ammunition or other vital supplies. If the choice is made not to reduce vehicle size, a vehicle powered by the Honeywell LV50 Turbine Power Pack System can carry 1,000 pounds of additional ammunition, armor, water or fuel. For example, the additional fuel payload option of 150 more gallons of fuel translates into 500 kilometers of extended range for a road march without resupply over a seven-day mission.

The LV50's integrated water recovery system produces 3-5 gallons of water per engine operating hour. If the water recovery system is not completely used, the turbine system's weight and volume savings allows additional water to be carried to support soldiers' needs. An additional 120 gallons of water per vehicle would provide in excess of 45,000 gallons of potable water for a Unit of Action. Over the course of a seven-day mission, this means an additional 2.6 gallons of water per soldier, per day – a full gallon more than the current water-consumption guideline. The ability to carry extra water provides a more reliable means of meeting a crew's water needs than existing water recovery systems.

Saving space means greater survivability. If neither additional fuel nor water is required for a mission, the weight and volume advantage of the LV50 System can be dedicated to an additional 10-12 rounds of canon ammunition or an additional 40 square feet of armor to increase the vehicle's survivability.

The Turbine Power Pack is Proven and Reliable

Unnecessary risk is also an enemy. Honeywell has produced more than 120,000 turbine engines for air and ground platforms, constantly refining technology and improving quality and reliability through a dedication to Six Sigma processes. Off-the-shelf availability, proven reliability and parts commonality with other operational turbine engines provides a significant logistical advantage for the Army.

Honeywell's LV50 Integrated Turbine Power Pack System proposed for the FCS is based on proven commercial engine core technology used in the highly successful LTS101 turbine helicopter engine. More than 1,500 LTS101 turbine engines are in service worldwide. Operating under the most demanding flying conditions, LTS101 turbines have logged more than 7.5 million flying hours while setting high standards for power, performance and reliability. The anticipated maintenance interval for the LV50 is more than 5,000 hours Mean Time Between Depot Removals (MTBDR). This estimate is derived directly from experience with the proven LTS101 engine core.

Turbine engines separate fact and friction. The inherent turbine technologies and advanced materials used in the LV50 minimize the impact of heat on engine operation and life. In comparison, a diesel engine has many frictional surfaces that are prone to wear out or generate heat that negatively affects engine operation and life. The waste heat generated by a diesel in the tight confines of a combat vehicle shortens engine life and limits power on hot days.

The Turbine Power Pack System is Durable

Turbine engines are always ready to rumble. Turbine engines are extremely rugged. They've performed exceedingly well in extensive vibration and ballistic impact tests. Turbine vehicles routinely pass fording tests in water deep enough to totally submerge the engine compartment. And, turbine engines are less affected by dust and sand contamination than diesel engines, because particulates pass through and are ejected by the engine, without contaminating the oil within its core.

The LV50 system is based on the LTS101 proven commercial helicopter propulsion system (also used on the HH-65 Coast Guard helicopter) that demands high reliability to ensure safety of flight and a high power-to-weight ratio. The LTS101 helicopter engine has achieved 5,300 hours of Mean Time Between Unscheduled Removals (MTBUR), even with operations at maximum power for longer periods. The sustained high performance of Honeywell's turbines is being proven daily with the T53 engine used on UH-1 helicopters, T55 engine used on CH-47 helicopters and AGT1500 engine used on the M1 Abrams Main Battle Tank.

Turbine engines run hot and cold. Turbine power packs have undergone rigorous testing to demonstrate their ability to perform in extreme temperatures. Diesels falter when the temperature hits triple digits and the full force of the desert heat can have a debilitating effect on their performance. Only the Honeywell LV50 Integrated Turbine Power Pack System performs without a hitch at-65° F, at +135°F, and at every temperature in between.

The Turbine Power Pack is Easy to Maintain

Turbine engines spend less time on the sidelines. With fewer parts to wear out and twice the reliability of a diesel, turbine-powered combat vehicles will spend less time in the repair depot and more time on the battlefield. Logistical requirements and repair costs are less with a turbine power pack. Compared to a turbine engine, diesel engines have more than 100 times the frictional area to wear out and generate heat. Less friction means parts last longer and less maintenance is needed. Turbines don't require scheduled oil changes and they don't need antifreeze, which can boil over leaving troops standing in the hot sun.

The LV50 system does not require periodic routine inspections, such as oil or coolant checks. The LV50's integrated physical health monitoring, enhanced diagnostics and an electronic logbook provide "go-no-go" engine recommendations and allow fast, cost-effective maintenance decisions. Honeywell, leveraging its long and extensive turbine maintenance experience, is designing an optimal logistics support plan for the LV50 system.

The LV50 has true multi-fuel capability. It can run on diesel fuel, jet fuel, gasoline and marine diesel fuel without modification. Diesel engines are much more sensitive to differences in fuel properties and injection system modifications are required for different fuel conditions. Honeywell's LV50 Integrated Turbine Power Pack can use the closest fuel source for refueling for the next seven-day mission, providing additional logistics benefits.

The integrated LV50 Power Pack System offers unprecedented diagnostic, monitoring and predictive trend analysis features to help the Army and individual crews anticipate a vehicle's maintenance needs. These features provide capabilities that enable a Total Logistics Support approach and significantly reduce maintenance costs.

Turbines get you back in the field faster. When repairs are required, turbine engines are easier to work on and can be quickly returned to service. The LV50 system is being designed for a one-hour field removal and replacement with only common hand tools. This is made possible by the simple interfaces a turbine has with the vehicle and by incorporating quick disconnects at all interface connections. Since the turbine engine weighs only 580 pounds, it can easily be lifted by a hoist so a recovery vehicle is not required. This low-weight system translates into lighter and easy-to-remove Line Replaceable Units (LRUs) such as generators. The two LV50 generators weigh only 60 pounds each versus a diesel generator, which weighs more than 300 pounds.

The LV50 Offers the Only True Integrated Systems Approach for the FCS

Honeywell supports the 'system with a system' concept. The integrated Honeywell LV50 Power Pack Solution supports the Army's "system within a system" philosophy by integrating key systems including generators, power management, air filtration, nuclear-biological-chemical, water recovery and thermal management.

In addition, the integrated power pack is self-contained, so it doesn't require an additional cooling system like a diesel. Integrating these mission-critical systems saves extensive weight and volume, which enables another distinct advantage for the LV50 system – sponson installation.

Integration equals performance. Only Honeywell has the systems integration capabilities to bring primary vehicle systems together within a common open architecture – powered by a real-time operating system. For the Future Combat System, we're developing a common control architecture that will enable data management for health monitoring and logistics management. The capture of knowledge management – combined with the lowest weight and volume solution – matches ideally with the FCS requirements for a "system within a system" approach that is lethal, agile, versatile, deployable, sustainable and survivable.

Honeywell's LV50 Integrated Turbine Power System is the Performance Choice

The turbine solution is the low-risk option. Honeywell's LV50 Integrated Turbine Power System is the clear choice for the Future Combat System. Consider all the critical factors: power to spare and the capacity for power expansion; the lowest weight and volume; enhanced survivability, enabled by a smaller vehicle signature; the broadest operational range; unsurpassed reliability; ease of maintenance and logistics; and experience, gained where it counts – on the battlefield.

The LV50 Integrated Turbine Power Pack System provides several significant advantages over a similar power class diesel for the FCS system:

- Weight – 1,800-2,400 pounds. system weight reduction (with vehicle size reduction)
- Volume - 24 cubic feet vehicle system volume reduction
- Fully integrated system - Engine, Generators, NBC, Thermal Management, Filtration
- Maintainability – 5,000 hour MTBDR
- Durability – Battle-proven Abrams Main Battle Tank turbine experience
- Easy field remove and replace - One hour with common tools
- Proven Total Logistic Support experience - Several implemented defense programs
- Detectability - No Smoke, Low Noise, Low Heat
- Operational Range - From -65 to +140 degrees Fahrenheit
- Power Growth - 30% growth within same envelope
- Life Cycle Cost – Lower LCC through longer maintenance intervals, higher reliability, greater durability and easier maintenance

The Honeywell integrated LV50 Turbine Power Pack System offers the best low-risk solution for the Army Transformation, the best overall value for the investment, and the best protection for American soldiers putting their lives on the line.

The choice is easy. But if you're still not convinced, give us a call at 602-231-7840 or 602-231-3052.